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INTRODUCTION

It is evident that for a flourishing furniture and joinery industry several raw materials are needed. But it all depends on the types of end product the industrialist is aiming at. The raw materials may range from wood itself to metal, glue, glass, foam rubber, leather, maroquin, cloth and so on. However, this document deals mainly with wood in all its forms.

As far as Mauritius is concerned, wood is available from two sources. A very limited amount is obtained from the local forests but most of it has to be imported from different countries to satisfy the demand for the furniture and joinery industries.

LOCAL FOREST PRODUCTS

Broadly speaking the local forest products can be divided into two categories:

(a) indigenous wood; and

(b) wood from exotic plantations.

The ecosystem in the indigenous forest is very fragile and difficult to recreate, whereas the exotic plantations are fast-growing, produce large volumes and can satisfy the demand of a bigger population on a smaller area.

(a) Indigenous wood

When the island of Mauritius was discovered over 300 years ago, it was uninhabited and covered with dense forests. In those days, the position of Mauritius in the South West of the Indian Ocean made it a convenient stopping place for sailing ships. The seamen, mainly Dutch, were able to replenish their supplies of fresh water and undoubtedly they took the opportunity to repair their ships and to replace broken masts and spars. On their incursions ashore, they found that the forests contained fine, straight, tall trees of strong and durable timber hitherto unknown to them.

The Dutch, finding the climate healthy and agreeable, made settlements in Mauritius and introduced domestic and wild animals. Grains, fruits and vegetables were also introduced with the object of providing fresh food to the sailing ships on the long voyage from Europe to the East Indies. The cultivation of food crops necessitated the clearing of the forest. The timber cut found its way to the European market. The unusual black wood of Ebony (Diospyros tesselaria) was in great demand. The activities of the Dutch were then concentrated on the cutting of

Ebony, Natte (Labourdonnaisia glauca), Makak (Mimusops petiolaris) and other timbers for the profitable European markets. The felling of these trees continued until they were too far from the shore so that transport of logs was no longer economically possible. This together with other adverse circumstances obliged the Dutch to leave the island in 1710.

A decade later, the French settled and the cleaning of the natural forest was accentuated to provide land for the cultivation of agricultural crops. In 1935, two-thirds of the total area of the island was still under primeval forest, but with the expansion of sugar cultivation this area had been reduced to one-sixth by 1872. To date, less than one per cent of the area of Mauritius is under some form of degraded native forest and this has been very rightly declared as a Strict Nature Reserve.

The best known and most important trees in the native forest are Natte (Labourdonnaisia glauca), Makak (Mimusops petiolaris), Tatamaka (Calophyllum inophyllum), Ebony (Diospyros tesselaria), Bois d'olive (Elaeodendron orientale), Bois de pomme (Syzygium glomerata) and Tambalacoque (Sideroxylon grandiflorum). Most of these timbers are hard, heavy and strong and the trees may take several hundreds of years before they are large enough to be sawn into planks.

When a natural forest is cut down the conditions which it has built up for its development over the centuries are destroyed and left to nature; a thousand years may pass before it is restored to its former state. It is therefore not economic to replace the destroyed natural forest by native trees, though they have to be maintained in order not to lose the genetic pool.

(b) Exotic wood

Over the past 200 years, many different kinds of trees have been brought to Mauritius from all over the world in order to determine which would grow quickly and provide the types of timber required for house building, furniture and the many other purposes for which wood is used. Amongst those successfully introduced are Terminalia arjuna, Terminalia catappa, Albizia lebbeck, Cassia florida, Casuarina equisetifolia, Azadirachta indica, Pterocarpus indica and Tectona grandis from India and the Far East;

Cinnamomum camphora, Cryptomeria japonica and Cunninghamia chinensis from China; Agathis robusta, Araucaria cunninghamii, Eucalyptus robusta, Eucalyptus tereticornis from Australia; Haematoxylon campechianum, Juniperus bedfordiana, Cedrela toona, Swietenia mahagoni, Pinus elliottii, Pinus taeda and Tabebuia pallida from Central America. Of these introduced trees, Albizia lebbeck, Swietenia mahagoni and Tabebuia pallida have been most successful in the warm low-lying parts of the island and provide valuable furniture timbers; while Eucalyptus spp., Cryptomeria japonica and Pinus elliottii are most extensively grown in the cooler upland areas and yield the structural and utility timbers for which the demand is greatest. (For some general notes on the timber of some of the species mentioned see Appendix I.)

From what has been said so far, one may have the false impression that there is plenty of furniture timber available from our forests. But in fact, there is very little Crown Forest Land available at low altitude for producing valuable timber for the furniture and joinery industries.

Out of 11,000 hectares of forest plantations, less than 1,000 ha are found at low altitude and only about two-thirds of the latter is planted to hardwoods including Eucalyptus tereticornis, Casuarina equisetifolia for poles and firewood. Whatever Tabebuia (Tecoma) plantations are being cut and utilized are not being replaced by the same species as the land is then used for other purposes. Table I shows the area of plantations by species.

Table I: Area of plantations by species.

Species		Approximate Area	
		Ha	%
1.	Pine (mostly P. elliottii)	7,300	66
2.	Other softwoods (Cryptomeria japonica, Araucaria cunninghamii, etc.)	1,500	14
3.	Eucalyptus (E. robusta, E. tereticornis) and Filao (Casuarina equisetifolia)	1,450	13
4.	Other hardwoods (Tabebuia pallida, T. pentaphylla, Cordia alliodora, Vitex glabrata, Swietenia mahagoni, Cassia spp., etc.)	750	7
	TOTAL	11,000	100

Moreover, most of our plantations are very young indeed. A close look at the age class distribution of the softwood plantations, that is Pine, Cryptomeria, Araucaria by age class distribution is given in Figure 1.

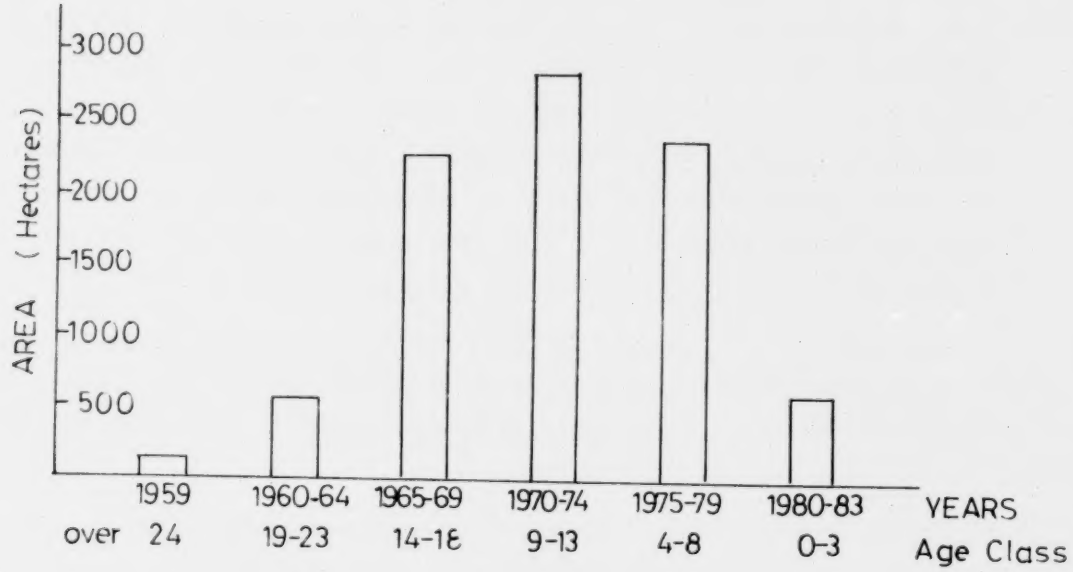

Fig. 1: Age class distribution of softwood plantations

Over 66 percent of the plantations are less than 13 years old. A fair proportion of the plantations that are over 19 years old are planted to Araucaria cunninghamii which has to be grown on at least a 70-year rotation. Pines are grown on a 25 to 30 years rotation to produce fair size timber of general utility. As it has a fairly nice figure, cheap furniture can be made from "CCA" impregnated wood.

At rotation age, a hectare of Pine may produce a final felling of about 100 m^3 of relatively good timber which can be used for interior decoration in houses. This volume, however, depends very much on the history of the plantation especially the effects of cyclones.

Tabebuia (Tecoma) has to be grown on a 70 to 80 year rotation, whereas a 125 to 150 year rotation is common to Swietenia mahagoni. They may produce between 300 and 350 m^3 per hectare at rotation age.

Following an agreement between the Government and Messrs. Grewals (Mauritius)

Limited, the state-owned forests are mostly exploited by the latter. In fact, this company is the sole legal concessionnaire.

IMPORTED FOREST PRODUCE

Forest produce are imported in several forms, viz. sawlogs, sawnwood, veneer sheets, plywood, reconstituted wood and paper products. Before discussing the forest produce that are imported, let us compare the volumes of timber imported in relation to local consumption. Fig. 2 shows the consumption of sawn timber in Mauritius for the period 1976 to 1982.

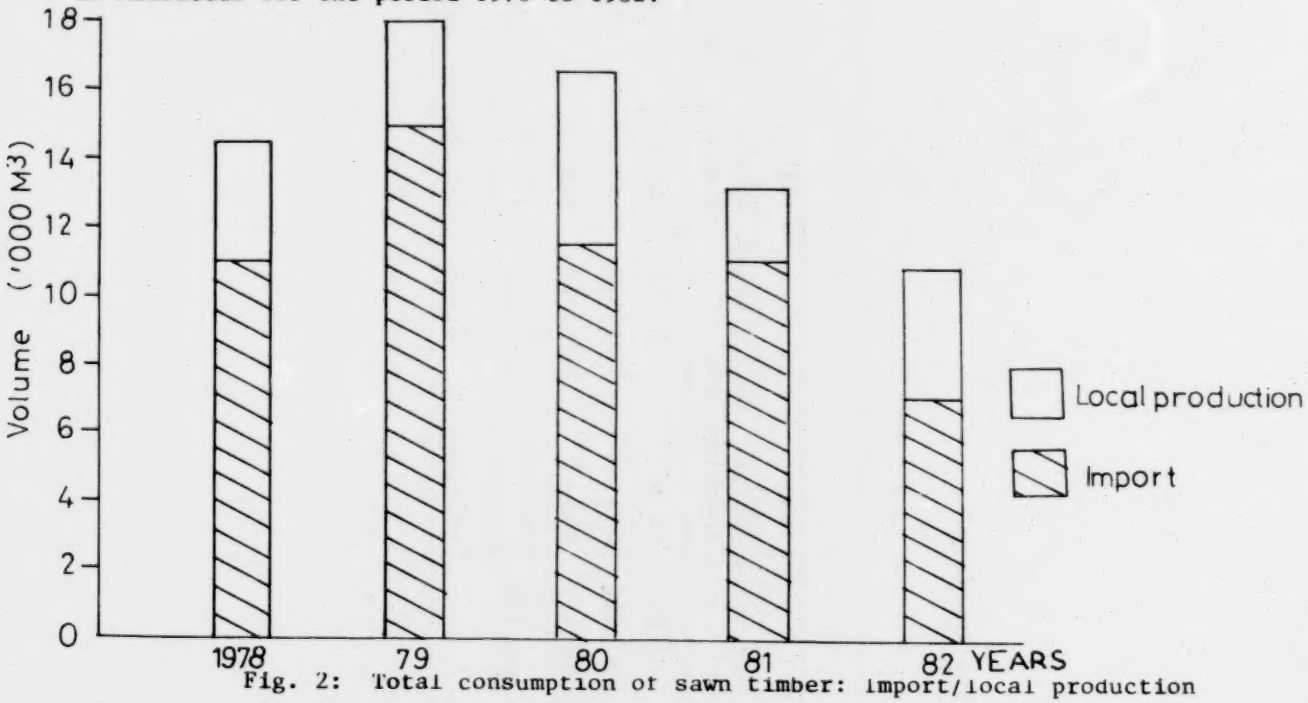

Fig. 2: Total consumption of sawn timber: Import/local production

Almost 70 percent of the sawm timber needed come from imports. At best, Mauritius can produce about 30 percent of its timber requirements, but a very little percentage of this will be wood that will be used in the furniture industry.

Table II gives the amount and value of forest products imported (apart from paper and paper products) for the periods 1979 to 1982. Data for 1983 are given in Table III.

Table II: Amount and value of forest products imported.

Description	Year							
	1979		1980		1981		1982	
	Approx. Quantity	C.I.F.Value US$	Approx. Quantity	C.I.F.Value US$	Approx. Quantity	C.I.F.Value US$	Approx. Quantity	C.I.F. Value US$
Sawlogs (conifer)	573 m^3	105.095	21 m^3	1.707	120 m^3	76.101	--	--
Sawlogs (non-conifer)	1437 m^3	63.694	663 m^3	346.575	562 m^3	200.126	275 m^3	168.703
Sawnwood	12168 m^3	3.168.471	8550 m^3	2.978.663	8629 m^3	2.827.296	5716 m^3	1.595.327
Plywood	1.018.000 square m	2.000.796	372.000 square m.	1.011.949	499.000 square m.	1.394.088	876.000 square m.	1.764.380
Reconstituted wood	--	--	73.000kg	5.405	160.000kg	136.226	133.000kg	170.865

Table III: Amount and value of forest products imported (1983)

Description	Quantity	C.I.F. Value US$
Sawlogs (conifers)	30.000 m^3	6.816
Sawlogs (non-conifers)	339.000 m^3	225.180
Sawnwood	8.282.000 m^3	2.066.880
Plywood	743.000 m^2	242.983
Reconstituted wood	47.000 kgs	16.038

IMPORTATION PROBLEMS

Let us now analyse the problems involved in the imports of timber. There are about twenty-five importers of timber in Mauritius (Appendix II gives a partial list of timber importers). Altogether, they import around 11,000 m^3 annually, though in 1982, the importation fell to 7,000 m^3, but the value was higher. The decrease in import was due to several factors, including the fall in the building industry and the restriction on imports in general.

The importation per annum per merchant varies between 150 and 2,500 m^3. The small amount that each merchant imports gives rise to a highly fragmented importation which in turn leads to several issues:

(i) each trader negotiates on his own to obtain his requirements and in so doing, he relies entirely on hard-driving foreign suppliers. The latter are in a position of strength to force their prices, thus holding the trader at their mercy;

(ii) each trader makes his own arrangements for the shipment of his consignment. In some cases he relies on the supplier to effect his for him. This presents several problems like:

  (a) delay in the delivery of the goods;

  (b) transshipment of goods from one cargo to another to reach the port of destination;

(c) deterioration in the state of the materials due to prolonged stocking in dockyards under unfavourable conditions; and

(d) repeated handling of the timber on several occasions.

(iii) Each trader has to pay various commissions and thus the cost of the goods is increased.

IMPORTED TIMBER SPECIES

Table IV further indicates that there are too many varieties of timber imported from various parts of the world: Gurjun, Meranti and Kempas from Malaysia, Pine from South Africa, Teak from Burma, Muninga from Tanzania, Sapele and Iroko from West Africa, Swietenia from Brazil and Beech from Europe. No doubt, this again fragments the volume of wood imported and leaves the importer at the mercy of the supplier.

Table IV: Some species of imported timber

Trade Name	Species	Countries of origin	Uses
Gurjun	Dipterocarpus glandiflorus D. alatus D. tuberculatus	Burma	Heavy construction carpentry, wharf docking, flooring
Kapur	Dryobalanops aromatica D. lanceolata	Malaysia/Indonesia	Carpentry light duty flooring
Kempas	Koompassia malaccensis	Malaysia/Indonesia	Structural work, flooring,poles,etc.
Keruing	Dipterocarpus cornutus D. apterus D. acutangulus	Malaysia/Indonesia	structural timber
Dark red Meranti	Shorea pauciflora S. curtisii S. platyclados S. platycarpa	Indonesia,Malaysia Philippines	joinery
Light red Meranti	S. parvifolia S. leprosula S. acuminata S. macroptera S. ovalis S. dasyphylla S. lepidota	Indonesia Philippines Malaysia	joinery
Impuia	Phoebe porosa	Brazil	joinery and furniture

Table IV: Some species of imported timber (continued)

Trade Name	Species	Countries of origin	Uses
Iroko	Chlorophora excelsa	West Africa/ East Africa	joinery and furniture
East Africa Olive	Olea hochstetteri	East Africa	joinery + furniture
Mahogany	Sweitenia mahagoni S. macrophylla S. humilis	Brazil	joinery + furniture
Muninga	Pterocarpus angolensis	East Africa	joinery, furniture and panelling
Pine	Pinus patula P. radiata P. elliottii	South Africa	joinery + panelling
Teak	Tectona grandis	India, Burma	joinery + furniture
Sapele	Entandrophragma cylindricum	West Africa	joinery + furniture
Beech	Fagus sylvatica	Federal Republic of Germany	furniture

Within certain trade names, eg. Gurjun, Keruing, Meranti, there are very many species of timber. Each species has its own characteristics and mechanical properties and makes working by machine on an industrial basis more difficult.

Furthermore, timber importers do not seem to bother much about the quality of the timber they import. Almost 60 percent of the wood imported are in the category of "Merchantable" grade as defined in the "Malayan Grading Rules for Sawn Hardwood Timber". This is the fourth grade, that is just above the "run-of-the-mill" grade. In general, "Merchantable" or as it is sometimes called "Serviceable and better" is a group of all grades (serviceable, sound, standard, select and prime) which consists of timber of a low quality - in fact an admixture of the worst of the better grades. Evidently, this has a direct repercussion on the furntiure and joinery industry.

In order to improve the supply of raw material, the first author thinks that it may be envisaged to group all the importers into a cooperative whereby they can carry out bulk purchases and charter boats to transport their commodities. The number of species imported may have to be reduced. New sources of timber that may be available closer to us will have to be tapped.

The purchase and the availability of plywood, fibreboards, blockboards, follow the same pattern as that of sawn timber.

The high raw material cost restricts the trade and forces the individual factory in the furniture and joinery industry to operate far below capacity levels, sometimes within a range of 20 to 25 percent.

WOOD BASED PANELS AND VENEERS

Firstly, plywood is imported from no less than a dozen countries. However, Malaysia and Singapore are the main suppliers with almost 90 percent. The other countries like the United Kingdom, South Africa, Hong Kong, the People's Republic of China, the China Island of Taiwan, Yugoslavia and Indonesia supply the remaining 10 percent. Veneered plywood sheets are normally finished in teak or sapele. Plywood is imported in at least a dozen dimensions, i.e.: 2m x 0.75m x 3 mm; 2m x 0.75m x 4mm; 2.10m x 0.90m x 3mm; 2.10m x 0.90m x 4mm; 2.45m x 1.20m x 3mm; 2.45m x 1.20m x 4mm; 2.45m x 1.20m x 6mm.

Secondly, blockboards and chipboards are usually imported from South Africa in 9, 12, 15 and 18 mm thickness. Veneered blockboards in Sapele, Afrormosia and Teak are on the market. Melamine chipboard in Sapele and Teak are also imported as finished panels.

Thirdly, hardboard is mostly imported from South Africa in the following dimensions: 2.45m x 1.20m x 3.2mm; 3m x 1.20m x 3.2mm.

The problems arising in importing panels and veneers: (a) the custom duty is high, i.e. 36.3 percent from countries that can issue Commonwealth Preferential Certificates; and 60.5 percent from other countries; (b) the demand for finished product is small so importers do not normally stock finished products like finished panels and veneers; (c) practical problems concerning veneers and veneered boards are that they need sophisticated machinery for cutting and glueing, which are not always available; and (d) they need special fittings that are not easily obtainable on the local market.

CONCLUSION

The local forest has a very limited scope to produce valuable furniture timbers, but every effort must be done to grow them wherever possible.

In order to make wood, as a raw material, available to the furntiure and joinery industry, it will have to rely on imports. The first author thinks that the following measures may be envisaged to make it a success:

(a) the import of timber has to be rationalized;

(b) a cooperative for the bulk purchase and imports of wood, timber, plywood, etc. has to be formed. It could also charter ships for the transport of these raw materials to reduce cost to the minimum.

(c) the number of species that are imported has to be condensed to get a more even raw material for machine working.

(d) new species of timber that are found in marketing areas closer to us have to be explored.

(e) good quality raw material at the lowest possible price has to be purchased.

APPENDIX I

TIMBER PROPERTIES OF SOME OF THE LOCAL SPECIES

1. Acacia eburnea (Cassis)

The sapwood is whitish in colour and not durable. It must be excluded from the heartwood when used. The latter is light brown when fresh, but will become reddish brown on oxidation specially when exposed to the sun. It is very hard and heavy (800 kg/m^3) when dried. It is strong and fairly difficult to work. It tends to snap where there is a knot. It has a very fine grain and a nice figure. It must be used in small pieces, eg. in chairs, flooring, etc.

2. Albizia lebbeck (Bois Noir)

The sapwood is whitish and the heartwood is light yellowish brown to light brown. The wood is moderately hard, coarse-grained, strong and fairly durable. It seasons well. It works and polishes easily. It is used for furniture, panelling, turnery and general construction. It weighs 560 kg/m^3 when dried.

3. Cryptomeria japonica (Cedar)

The heartwood is brown with yellow or dark brown streaks forming a somewhat wavy pattern. It is harder and of a finer texture than Cypress. 500 kg/m^3 when dried. There is a tendency for the wood to split and check. It is durable. It saws and machines with only a moderate blunting effect on cutting edges. Knots can be troublesome in planing and moulding since the tendency of the grain to tear is increased in the vicinity of knots. With care, the wood can be finished smoothly. It takes the usual finishing treatment quite well. Splits in nailing but holds screws well. Good for rustic furniture and interior decorations.

4. Casuarina equisetifolia (Filao)

The sapwood is pinkish to light brown, the heartwood is slightly darker in colour. The fine textured wood is very hard, heavy (650 kg/m^3) and very susceptible to attack by dry wood termites. It is strong, tough, difficult to saw, but cracks and splits and is not durable in the ground. Its rate of air seasoning is moderate but the amount of degrade is considerable. Machining characteristics are as follows: Planing and turning are fair; shaping, boring, mortising, sanding and resistance to screw splitting are moderate. Its uses include fenceposts, poles, beams, oxcart tongues, charcoal and fuel.

5. Eucalyptus robusta (Eucalyptus rouge)

The sapwood is light brown and the heartwood salmon to light brown. The wood is hard, moderately heavy (600 kg/m^3), strong, brittle, stiff, coarse in texture and fairly straight-grained with some interlocked grain. The rate of air-seasoning is moderate but with considerable degrade from warp and with very great uneven shrinkage. Machining characteristics are as follows: planing, shaping, turning, mortising and sanding are good; boring is fair; resistance to screw-splitting is excellent. Not used in the furniture industry.

6. Eucalyptus tereticornis (Eucalyptus blanc)

More or less the same as Eucalyptus robusta but with more degrade on seasoning.

7. Pinus elliottii (Pine)

The wood is whitish to yellowish white in colour. It is fairly soft and rather coarsely textured, but with a fine figure. It is light (450 kg/m^3) and works easily. It planes and grooves very easily. It takes timber preservatives very well. Care must be taken to reduce degrade when drying. It can be used for cheap furniture.

8. Tabebuia pallida, Tabebuia pentaphylla (Tecoma)

The heartwood is whitish to greyish in colour with fine brown lines. It cannot be easily separated from the similar sapwood. The wood is moderately hard, moderately heavey (500 kg/m^3), strong, with medium to coarse texture with straight to interlocked grains. The rate of air seasoning is rapid and the amount of degrade is moderate. Machining characteristics are as follows: planing and resistance to screw splitting are fair, shaping, boring, mortising and sanding are excellent; turning is good. It is moderately durable. It is used for furniture, cabinet work and other interior decorations.

APPENDIX II

PARTIAL LIST OF TIMBER IMPORTERS IN MAURITIUS

1.	Abdoola, I. + Fils	20 La Paix Street, Port Louis
2.	Alladee, M. H.	Victoria Square, Port Louis
3.	Chantier Colonial	Port Louis
4.	Chantier de Paris	Rose Hill
5.	Chantier de Plaisance	Rose Hill
6.	Chantier Ramtoola	1 J. Mosquée Street, Port Louis
7.	Chantiers Réunis + Cie.	R. Noël Street, Port Louis
8.	Chantier de Singapour (Currimjee Jeewanjee + Co.Ltd.)	Farquhar Street, Port Louis
9.	Chui Yan Store	Port Louis
10.	Dragon d'Or	Pour Louis
11.	Grewals (M'tius) Ltd.	Pailles
12.	Joonas + Co. Ltd.	Port Louis
13.	Lai Fat Fur Bros.	Royal Street, Port Louis
14.	Mayflower Industries Ltd.	St. Vincent de Paul Street, Pailles
15.	Meubles Laval Ltée	Roche Bois
16.	Quincaillerie Amicale	Port Louis
17.	Quincaillerie Centrale	Port Louis
18.	Société Lam Yan On	La Paix Street, Port Louis
19.	Sonah + Co. Ltd.	Louis Pasteur Street, Port Louis
20.	Succession Cajee Mahmood	Port Louis